CHAPTER 17
NOISE

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

17. NOISE

17-1 INTRODUCTION

Highway traffic is one of the more dominant sources of noise in urban and rural areas of Florida. In an effort to encourage the control of noise, Congress passed the ***Noise Control Act of 1972***. Congress further directed the Federal Highway Administration (FHWA) to develop noise standards associated with traffic. However, effective control of traffic noise requires the control of land use planning next to highways, and reasonable and feasible abatement associated with highway projects.

The control of land use is traditionally the responsibility of local government. The control of traffic noise associated with specific highway projects is the responsibility of the transportation agency (or agencies) that are planning, designing, and constructing the project.

This chapter of the *Florida Department of Transportation (FDOT) Project Development & Environment Manual (PD&E Manual)* constitutes the official FDOT noise policy and procedures for the purpose of meeting the requirements of *Title 23 of the Code of Federal Regulations (CFR) Part 772* and applicable state laws.

The noise impact and abatement analysis policy and procedures provided in this chapter are based largely on the regulatory material that is found in ***23 CFR 772 "Procedures for Abatement of Highway Traffic Noise and Construction Noise"*** dated July 13, 2010, and the FHWA guidance document "***Highway Traffic Noise: Analysis and Abatement Guidance"*** dated June 2010 (revised December 2010). These two documents are incorporated into this chapter of the PD&E Manual by reference. In addition, ***Chapter 335.17, Florida Statute***, requires the use of ***23 CFR 772*** in the noise impact assessment process, regardless of funding. Finally, the ***FDOT Policy Number 000-360-005***, ***"Noise Abatement"*** dated September 20, 2007, delineates the FDOT policy related to traffic noise abatement.

The following is a brief outline of the steps that are followed by the FDOT to assess traffic noise as a part of the Project Development and Environment (PD&E) process.

The first step in the PD&E process is the determination of the Class of Action applicable to the project. These are Categorical Exclusion (CE – Type 1, Programmatic and Type 2), Environmental Assessment (EA), Environmental Impact Statement (EIS), Non-Major State Action (NMSA) or State Environmental Impact Report (SEIR). These are referred to as "environmental document" in this chapter. ***Part 1 Chapter 2, Environmental Class of Action Determination, of the PD&E Manual*** addresses the level of environmental documentation for all federal actions. ***Part 1 Chapter 10***, ***Non-federally Funded Projects***, addresses the level of environmental documentation for non-federal actions.

The next step is a preliminary review of potential noise impacts which is used primarily for scoping purposes. This review should determine if noise levels will

approach or exceed the noise abatement criteria, if noise sensitive receptors are (or may be) within the project area, and if noise impacts may occur. The review will include the assessment of land use plans, aerial photography, field reviews, modeling, and/or similar efforts. This will allow the reviewer to determine whether noise impacts are likely to occur. Projects for which the Class of Action is determined to be a CE - Type 1, Programmatic CE or NMSA should be reviewed for possible noise impacts. If this possibility exists, a more detailed noise assessment should be performed to determine if the project can still be classified as a CE - Type 1, Programmatic CE or NMSA. If this review indicates the possibility of a noise impact, then a detailed noise study is performed consisting of field data collection and computer analysis. The computer analysis will use the latest version of the FHWA Traffic Noise Model (TNM).

During or after data collection, the preparation of a ***Noise Study Report (NSR)*** is started. The ***NSR*** contains the assumptions, data, procedures and results from the noise study, as well as the conclusions drawn from it. When the noise impact analysis and the ***NSR*** are completed, the ***NSR*** is forwarded to FHWA (as applicable) for review along with the Type 2 CE's, EA or EIS, or maintained in the file with the CE - Type 1, Programmatic, NMSA or SEIR.

Finally, excerpts and summaries from the ***NSR*** are put into the environmental document. The Noise section of the environmental document should contain enough detail to convey the degree of noise impact attributed to the proposed project, along with certain required statements. The environmental document will reference the ***NSR*** for additional details using a statement similar to the following:

> "The Noise Study Report for this project is available from the District Office, located at _____."

The environmental document will also include information regarding the consideration of noise abatement measures that have or have not been determined to be feasible and reasonable based on the information available at the time the ***NSR*** was completed. After Location and Design Concept Acceptance has been received or the SEIR has final approval, a copy of the ***NSR*** is sent to the appropriate local government officials who have jurisdiction where the highway project is located. Other information that will aid these officials in their efforts to minimize highway noise impacts in the future may be sent along with the ***NSR***.

23 CFR 772.1 identifies that the purpose of the regulation is to provide procedures for noise studies and noise abatement measures. ***Chapter 17 of the PD&E Manual*** describes how this purpose will be met.

23 CFR 772.3 identifies that this regulation constitutes the noise standards mandated by ***23 U.S.C. 109(1)***. The FHWA and the FDOT consider that all highway projects developed in conformance with this regulation shall be deemed to be in accordance with the FHWA noise standards.

17-2 DEFINITIONS

1. **Approach Criteria**. Approaching the criteria means within 1 decibel (dB) of the appropriate FHWA abatement criteria.

2. **Benefited Receptor**. The recipient of an abatement measure that receives a noise reduction at or above the minimum threshold of 5 dB(A). Only benefited receptors will be included in the calculation used to determine that a proposed noise abatement measure has a reasonable cost.

3**. Common Noise Environment**. A group of receptors within the same Activity Category found in ***Table 17.1*** that are exposed to similar noise sources and levels; traffic volumes, traffic mix, and speed; and topographic features. Generally, common noise environments occur between two secondary noise sources, such as interchanges, intersections and/or cross-roads. A common noise environment involves a group of impacted receptors that would benefit from the same noise barrier or noise barrier system (i.e. overlapping/continuous noise barriers).

4. **Date of Public Knowledge**. The approval date of the Categorical Exclusion (CE), the Finding of No Significant Impact (FONSI), the Record of Decision (ROD), State Environmental Impact Report (SEIR) or Non-major State Action (NMSA). For a Type1 CE, Programmatic CE and NMSA, this is the date of the Type 1, Programmatic CE or NMSA Checklist. Any noise sensitive receptor that is permitted between the completion of the ***NSR*** and the Date of Public Knowledge will be analyzed for traffic noise impacts and feasible and reasonable abatement considered during the design phase of the project

5. **Decibel**. A unit of measure of sound level. The number of decibels is calculated as ten times the base-10 logarithm of the square of the ratio of the mean-square sound pressure (often frequency weighted), and the reference mean-square sound pressure of 20 μPa, the threshold of human hearing. For traffic noise purposes the A-weighted scale, which closely approximates the range of frequencies a human ear can hear, is used. The A-weighted decibel is abbreviated dB(A).

6. **Design Year**. The future year used to estimate the probable traffic volume for which a highway is designed.

7. **Environmental Document**. A CE (Type 1, Programmatic and Type 2), EA, EIS, NMSA or a SEIR that is used to identify environmental impacts associated with a transportation improvement project.

8. **Existing Noise Levels**. The worst noise hour resulting from the combination of natural and mechanical sources and human activity usually present in a particular area, which includes traffic noise if there is an existing highway.

9. **Feasibility**. The combination of acoustical and engineering factors considered in the evaluation of a noise abatement measure.

10. **Impacted Receptor**. The recipient that has a traffic noise impact.

11. **Insertion Loss**. The reduction of traffic noise levels as a direct result of a specific type of abatement measure.

12. **Leq.** The equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

13. **Multifamily Dwelling**. A residential structure containing more than one residence. Each residence in a multifamily dwelling shall be counted as one receptor when determining impacted and benefited receptors. For modeling purposes, a single receptor may be used to represent one or more residential dwelling units within a multifamily dwelling.

14. **Noise Abatement Criteria (NAC)**. The noise level, depending upon activity category, at which the FDOT must consider noise abatement. The NAC can be found in ***Table 17.1***.

15. **Noise Barrier**. A physical obstruction that is constructed between the highway noise source and the noise sensitive receptor(s) that lowers the noise level, including stand alone noise walls, noise berms (earth or other materials), and combination berm/wall systems.

16. **Noise Reduction Design Goal**. The optimum desired dB(A) noise reduction (insertion loss) determined from calculating the difference between future build noise levels with abatement to future build noise levels without abatement. The FDOT noise reduction design goal is 7 dB(A) for at least one impacted receptor.

17. **Permitted**. Development will be deemed to be permitted if the local agency with jurisdiction has granted a building permit for a specific edifice associated with a noise sensitive land use such as residential (e.g., house), school (e.g., classroom building), place of worship (e.g., church), medical facility (e.g., hospital), institutional (e.g., library), etc., prior to the project's Date of Public Knowledge.

18. **Predicted Existing Traffic Noise Level**. The traffic noise level that is determined through the use of the TNM for existing roadway conditions.

19. **Predicted Future Traffic Noise Level**. The traffic noise level that is determined through the use of the TNM for future roadway conditions, including build and no-build options. This is typically done for the design year.

20. **Property Owner**. An individual or group of individuals that holds a title, deed, or other legal documentation of ownership of a property or a residence.

21. **Reasonableness**. The combination of social, economic, and environmental factors considered in the evaluation of a noise abatement measure.

22. **Receptor**. A discrete or representative location of a noise sensitive area(s) for any of the land use categories listed in ***Table 17.1***.

23. **Residence**. A dwelling unit. Either a single family residence or each dwelling unit in a multifamily dwelling.

24. **Statement of Likelihood**. A statement provided in the environmental clearance document based on the feasibility and reasonableness analysis completed at the time the environmental document is being approved.

25. **Substantial Noise Increase**. For a Type I project, an increase in noise levels of 15 dB(A) or more in the design year over the existing noise level (measured or predicted) as a direct result of the transportation improvement project in question. A substantial increase will normally occur only on new alignment projects.

26. **Traffic Noise Impacts**. Design year build condition noise levels that approach or exceed the NAC listed in ***Table 17.1*** for the future build condition; or design year build condition noise levels that create a substantial noise increase over existing noise levels.

27. **Type I Projects**

(1) The construction of a highway on new location;

(2) The physical alteration of an existing highway where there is either;

(i) Substantial Horizontal Alteration. A project that halves the distance between the traffic noise source (edge of the nearest travel lane) and the closest receptor between the existing condition to the future build condition; or,

(ii) Substantial Vertical Alteration. A project that removes shielding, (not to include vegetation removal) therefore exposing the line-of-sight between the receptor and the traffic noise source. This is done by either altering the vertical alignment of the highway or by altering the topography between the highway traffic noise source and the receptor, such as reducing the back slopes of a cut section so that the line of sight is no longer blocked, or a project that has a two foot or more vertical change in the pavement elevation;

(3) The addition of a through-traffic lane(s). This includes the addition of a through-traffic lane that functions as a High-Occupancy Vehicle (HOV) lane, High-Occupancy Toll (HOT) lane, bus lane, or truck climbing lane;

(4) The addition of an auxiliary lane, except for when the auxiliary lane is a turn lane;

(5) The addition or relocation of interchange lanes or ramps added to a quadrant to complete an existing partial interchange;

(6) Restriping existing pavement for the purpose of adding a through-traffic lane or an auxiliary lane;

(7) The addition of a new or substantial alteration of a weigh station, rest stop, ride-share lot, or toll plaza. (Note: Reconstruction of an existing rest stop/service plaza in the median of an existing highway that does not cause substantial alteration and does not affect existing traffic patterns on the roadway along with the conversion of a conventional toll plaza to an all electronic toll plaza do not qualify as Type I projects.).

(8) If a project is determined to be a Type I project under this definition, then the entire project area as defined in the environmental document is a Type I project and would require a noise analysis.

28. **Type II Project**. A Federal, Federal-aid, or state funded highway project for noise abatement on an existing highway. Type II projects are commonly referred to as retrofit projects and are allowed (but not mandatory) under ***23 CFR 772***. **The FDOT does not have a Type II program.**

29. **Type III Project**. A Federal, Federal-aid, or state funded highway project that does not meet the classifications of a Type I or Type II project. Type III projects do not require a noise analysis. Examples of Type III projects include:

(1) Construction of bicycle and pedestrian lanes, paths, and facilities;

(2) Activities included in the FDOT highway safety plan under ***23 U.S.C. 402***;

(3) Landscaping (including the removal of existing vegetation);

(4) Installation of fencing, signs, pavement markings, small passenger shelters, traffic signals, and railroad warning devices where no substantial land acquisition or traffic disruption will occur;

(5) Deployment of electronics, photonics, communications, or information processing used singly or in combination, or as components of a fully integrated system, to improve the efficiency or safety of a surface transportation system or to enhance security or passenger convenience;

(6) Modernization of a highway by surfacing, restoration, rehabilitation, or reconstruction; or

(7) Placement of overhead gantries on a highway to collect tolls electronically that do not disrupt existing traffic patterns.

17-3 APPLICABILITY

The requirements of ***23 CFR 772*** apply to all Federal or Federal-aid Highway Projects authorized under ***Title 23, United States Code***. By Florida Law ***(Chapter 335.17, F.S.)***, all highway projects by the FDOT, regardless of funding source, shall be developed in conformance with federal standards for noise abatement as contained in

23 CFR 772. Therefore, this regulation applies to any highway project or multimodal project that:

1. Requires FHWA approval regardless of funding sources;

2. Is funded with Federal-aid highway funds; or

3. Is funded for all implementation phases solely with Florida state funds.

The effective date of the revisions to ***23 CFR 772*** is July 13, 2011. FHWA has determined that the following types of projects are "grandfathered" and will not have to meet the ***23 CFR 772 Final Rule*** (dated July 13, 2010):

1. Federal-aid highway projects for which the CE, FONSI, or ROD has been signed by the effective date of the final rule, which is July 13, 2011.

2. Design phase reevaluations for which approval has been received prior to July 13, 2011.

If approval of the environmental clearance document or the design phase reevaluation has not been received prior to July 13, 2011, the noise study must follow the requirements of ***23 CFR 772*** dated July 13, 2010. All FDOT contracts executed after July 13, 2011 shall have their noise studies performed in conformance with ***23 CFR 772*** and ***Part 2, Chapter 17 of the PD&E Manual*** as they exist on that date. The original Date of Public Knowledge remains valid unless a reevaluation identifying a substantial vertical or horizontal change is completed. Non-Federal-aid highway projects shall be "grandfathered" and will not have to meet the ***23 CFR 772*** final rule (dated July 13, 2010) if the SEIR document or NMSA Checklist has been signed by July 13, 2011.

In order to obtain FHWA approval, the FDOT has developed this noise policy and associated procedures that are in conformance with ***23 CFR 772***. The FDOT shall apply these policies and procedures uniformly and consistently statewide. ***23 CFR 772*** applies to all Type I projects unless the regulation specifically indicates that a section only applies to Type II or Type III projects.

The development and implementation of Type II projects are not mandatory requirements of ***Section 109(i) of Title 23, United States Code***. **The FDOT does not have a Type II program.**

Type III projects do not require the FDOT to complete a noise analysis or consider abatement measures.

17-4 TRAFFIC NOISE PREDICTION

A traffic noise analysis shall be completed for each alternative under detailed study and for each Activity Category (AC) of the NAC shown in ***Table 17.1*** that is present in the study area. Noise level predictions will be required for the following project alternatives and study years:

ALTERNATIVE	YEAR
No-build	Existing and design year
Build	Design year only

17-4.1 Model Requirements

The FDOT will conduct any predictive analysis required by ***23 CFR 772.9*** using the FHWA Traffic Noise Model (TNM) as described in ***"FHWA Traffic Noise Model Users Manual" Report No. FHWA-DP-96-009***.

Consistent with ***23 CFR 772.9(b)***, average pavement type shall be used in the FHWA TNM for future noise level predictions. However, in the assessment of existing conditions (including the validation of field measurements), the actual pavement type may be used at the discretion of the District Noise Specialist.

The FHWA allows the use of noise contour lines for project alternative screening or for land use planning to comply with ***23 CFR 772.17***, but noise contours shall not be used for determining highway traffic noise impacts. Additional information on the development and use of noise contours can be found in ***Section 17-8.4*** of this chapter.

17-4.2 Traffic Requirements

In predicting noise levels and assessing noise impacts, traffic characteristics that would yield the worst traffic noise impact for the design year shall be used. Typically this traffic characteristic involves the maximum number of vehicles traveling at the posted speed limit under level of service (LOS) "C" condition. Experience has shown that the highest traffic volume and the highest average speed usually create the noisiest conditions. Maximum peak-hourly traffic representing LOS "C" will be used (unless analysis shows that LOS "C" will not be reached). For ramp traffic, use the demand LOS. Consistent with the use of LOS "C", the speed assigned to vehicles should be the posted speed limit. If the expected posted speed for the future build condition cannot be determined, the design speed established for the conceptual design can be used. The FDOT District Traffic Operations staff may be able to provide some guidance concerning posted speed limits for a particular roadway.

17-4.3 Receptor Data

In determining traffic noise impacts, primary consideration shall be given to exterior areas where frequent human use occurs, unless no exterior activities are likely based on field observation. Interior predictions for Activity Category D should be coordinated with the District Noise Specialist to insure proper application.

Unless the area of exterior frequent human use is identified elsewhere, residential receptor sites should be placed at the edge of the dwelling unit closest to the major traffic noise source or as dictated by professional judgment.

When more than one unit is clustered together, a single receptor can be analyzed as representative of a group of noise sensitive sites. Other noise sensitive receptors

include parks, schools, hospitals, and other sites where quiet is important for normal activities. The location of the receptor in these cases will be dictated by the location of the noise source and the exterior activity that may be impacted, if any.

Receptor heights for first floor receptors are always assumed to be 5 feet above ground and second story receptor heights are modeled at 15 feet above ground level. Higher story receptors heights for the purpose of modeling will have to be determined on a case by case basis. The maximum horizontal distance from the edge of pavement that a receptor site will be modeled will vary based on topography and traffic conditions and will be determined on a case by case basis. At a minimum the horizontal distance should be sufficient to identify all potential impacts consistent with the requirement of ***23 CFR 772***. If there is any question concerning the modeling of a receptor location, contact the District Noise Specialists for guidance.

17-4.4 Noise Descriptor

The noise level descriptor used by the FDOT will be Leq. Leq is the equivalent steady-state sound level which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same time period, with Leq(h) being the hourly value of Leq.

17-5 ANALYSIS OF TRAFFIC NOISE IMPACTS

23 CFR 772.11(a) requires that the FDOT shall determine and analyze expected traffic noise impacts:

1. For projects on new alignments, determine existing noise levels by field measurements.

2. For projects on existing alignments, predict existing and design year traffic noise levels using the latest version of TNM.

23 CFR 772.11(b) further states that in determining traffic noise impacts, the FDOT shall give primary consideration to exterior areas where frequent human use occurs.

17-5.1 Field Measurements for Establishment of Ambient Noise Conditions

Field measurements are required along a new alignment to determine the existing noise levels as noted in ***23 CFR 772.11(a)(1)***. This also applies where traffic noise does not exist or is only a minor element in the overall noise. Noise monitoring is to follow the basic FHWA procedures found in ***"Measurement of Highway-Related Noise"***. Measurements should be taken 5 feet above ground level and within 100 feet of the centerline of the proposed roadway alignment. If possible, a location along the alignment should be chosen that represents a potentially noise sensitive receptor and that has a noise environment similar to most areas along this section of the alignment. At each measurement location, a minimum of 30 minutes of readings (3 repetitions of 10 minutes each) shall be taken. Use an integrating Sound Level Meter (ANSI Type 1 or 2) as noted in ***Section 772.11(d)(3)*** and note the pertinent field conditions. At least two

sets of readings (if practical) should be taken at each location. While it may not always be practical, it is recommended that one set of readings be taken during the morning hours and a second set taken during the afternoon hours. It is further recommended that these readings be taken over a period of two or more days. The resultant noise level for each reading shall be noted and an average ambient reading for each site shall be determined. The average ambient reading (from all sources) shall be compared to the predicted future project traffic noise level to determine the increase (if any) in the noise level that can be expected in the area as a result of the proposed project. The entire project corridor should be reviewed under these conditions to determine if any unusual noise sources (aircraft, industrial, electrical generators, insects or other animals, etc.) exist that may influence the ambient readings. If any unusual noise sources are noted during the study, they must be identified in the field documentation. Specific questions regarding ambient noise field measurements should be directed to the District Noise Specialist.

17-5.2 Field Measurements for Model Validation

The primary purpose of field measuring existing traffic noise levels is to ensure that:

1. Traffic noise is the main source of noise; and

2. To validate the TNM input values and verify that the model accurately predicts the existing traffic noise based on the current conditions.

Traffic noise monitoring is conducted in accordance with the FHWA's measurement procedures found in the FHWA report ***"Measurement of Highway-Related Noise"*** and supplemented with accepted professional judgment.

Perform monitoring for a minimum of 30 minutes (3 repetitions of 10 minutes each) using an integrating Sound Level Meter (ANSI Type 1 or 2) as noted in ***Section 772.11(d)(3)***, noting the following:

1. Average vehicle speed for all classes of vehicles (using a radar unit or equivalent method for measuring speeds, such as electronic portable traffic speed and traffic counters);

2. Vehicle counts and class identification (automobiles, motorcycles, buses, medium trucks, heavy trucks);

3. Unusual noises (aircraft flyovers, trains, barking dogs, insects or other animals, etc.);

4. All input parameters necessary to run the computer model, including:

    a. Distance from the edge of the nearest travel lane of each roadway to the noise monitoring location;

    b. Width of roadway lanes and paved shoulders;

c. Height of the sound level meter;

d. Barrier/buffer information including trees, berms, structures;

e. Type of propagation path (hard versus soft);

f. Variations in terrain between the sound level meter and the source;

g. Grade, if any; and

h. The existing pavement type and condition.

If the field data was gathered without unusual noise disturbances, such as barking dogs or aircraft flyovers, the field measurement study will be considered complete. If not, and a logical explanation for any unusual readings cannot be made, the field measurements at that location(s) should be repeated in accordance with the FHWA's current measurement procedures. Field measurements may also require repetition if the application of the TNM modeling process does not result in an acceptable level of accuracy as required by ***23 CFR 772.11(d)(2)***. As noted in the FHWA guidance document ***"Highway Traffic Noise: Analysis and Abatement Guidance"***, the model is validated if existing field measured highway traffic noise levels and predicted highway traffic noise levels for the existing condition are with +/- 3 dB(A). As noted in ***Section 17-4.1***, the application of a pavement type other than "average pavement" may be used to validate existing traffic noise conditions.

17-5.3 Computer Prediction of Existing and Future Traffic Noise Levels

Using the latest version of TNM, traffic noise levels are predicted for the existing and design year using the appropriate traffic data and roadway configurations. This prediction applies to those receptors selected as specified in ***Section 17-4.3***. When non-highway transportation noise sources (airport operations, transit lines, light commuter rail, etc.) impact the noise environment next to a highway, this impact should be noted in the ***NSR***. Assessment of the magnitude of airport operation impacts should be done using the appropriate regulatory guidelines provided by the Federal Aviation Administration (FAA) guidance ***"Airport Noise Compatibility Planning"***. Assessment of the magnitude of noise impacts from rail and transit facilities shall be done using Federal Railroad Administration (FRA) guidance ***"Railroad Noise Emissions Compliance Regulations"*** and Federal Transit Administration (FTA) guidance ***"Transit Noise and Vibration Impact Assessment"***. As stated above, the FDOT shall give primary consideration to exterior areas where frequent human use occurs in determining traffic noise impacts.

17-5.4 Traffic Noise Impacts

A traffic noise impact occurs when the modeled future highway traffic noise levels for the worst case noise condition (usually LOS "C") approach or exceed the NAC. A traffic noise impact also occurs when modeled future highway traffic noise levels substantially exceed the existing highway traffic noise level, even though the modeled

levels may not exceed the NAC. The FHWA has established NAC that are used to determine whether a highway traffic noise impact occurs. The FDOT has determined that the NAC is approached when it is within 1 dB(A) of the appropriate NAC and that a substantial increase occurs when the increase over existing conditions (measured or predicted) is 15 dB(A) or greater. To assess the highway traffic noise impact of a project, the FDOT must evaluate both criteria (approach and substantial increase).

Design year traffic noise impacts are based on the modeled future build noise levels or the difference between the future build and existing measured or predicted traffic noise levels. If one or more noise sensitive receptors are affected by project related traffic noise levels which approach or exceed the NAC or substantially exceed existing (measured or predicted) noise levels, then abatement measures must be considered. If the abatement criteria is not approached or exceeded or if projected traffic noise levels do not substantially exceed existing noise levels, abatement measures will not be considered.

For example, if the difference between the future build and existing condition predictions shows an increase of 1 dB(A), from 66 dB(A) to 67 dB(A), then the project can be stated to have no substantial increase on highway traffic noise. However, since the predicted level approaches or exceeds the FHWA NAC (assuming a Category B site), noise abatement must be considered. If the predicted increase went from 42 dB(A) (existing) to 63 dB(A) (build), the project would be considered to have a substantial increase and would require abatement consideration. For an Activity Category B receptor site with a predicted future noise level of 66 dB(A), the approach criterion would be met and abatement must be considered. However, a level of 65.9 dB(A) would not be considered to have approached or exceeded the abatement criterion and abatement consideration would not be required.

17-5.5 Noise Abatement Criteria Activity Categories

Table 17.1 contains seven categories of activity/land use that are used to assess the impact of noise on these activities. The following is a description of each activity category and the traffic noise impact level at which abatement measures must be considered.

17-5.5.1 Activity Category A

Activity Category A focuses on the exterior impact criteria for lands on which serenity and quiet are of extraordinary significance and serve an important public need, and where the preservation of those qualities is essential for the area to continue to serve its intended purpose. The approach NAC level for this activity category is 56 dB(A). An example of this activity category would be the Tomb of the Unknown Soldier. The FDOT shall submit justification to the FHWA, on a case by case basis, for approval to apply this activity category to a noise sensitive receptor.

17-5.5.2 Activity Category B

Activity Category B includes the exterior impact criteria for single-family (including mobile home parks) and multifamily residences. This may include units above the

ground level. The approach NAC level for this activity category is 66 dB(A). No criteria exist for interior areas for residential land uses.

17-5.5.3 Activity Category C

Activity Category C includes the exterior impact criteria for a variety of land use facilities. The approach NAC level for this activity category is 66 dB(A). Examples of this activity category include active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, golf courses, ***Section 4(f)*** sites, schools, television studios, trails, and trail crossings. Note that these criteria apply only to the exterior areas of Activity Category C. The FDOT will conduct impact assessments for these land use types consistently on a statewide basis. This will involve the identification of the land use through a field review and making a determination of whether exterior areas of frequent (or potentially frequent) human use occur that might be impacted by future traffic noise levels for the build condition that approach or exceed the NAC. If exterior areas of frequent human use for this NAC category are noted during the field review, detailed modeling of the receptor will occur to determine if an exterior noise level impact will occur in the future with the construction of the project.

Where applicable, the FDOT research publication ***FL-ER-65-97*** (updated 2009) entitled ***"A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations"*** shall be used to assess whether noise abatement is feasible and/or reasonable at Activity Category C locations.

17-5.5.4 Activity Category D

Activity Category D includes the interior impact criteria for a variety of land use facilities listed in Activity Category C that may have interior uses. The approach NAC level for this activity category is 51 dB(A). Examples of this activity category include auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios. Note that these criteria apply only to the interior areas of this activity category, and will only be analyzed when no exterior activities are affected by traffic noise or if exterior areas are determined to be impacted but exterior abatement measures are not feasible and reasonable. An interior analysis will only be performed after exhausting all outdoor analysis options. When a traffic noise impact is identified for this activity category, the FDOT will conduct impact assessments for these land use types consistently on a statewide basis. This will involve:

1. The identification of the building envelope for expected noise reduction based on the information found in ***Table 6*** of the FHWA guidance document and shown in ***Table 17.2***;

2. Determination of the open window/closed window condition; and,

3. If deemed appropriate, physical measurements of the amount of noise

reduction provided by the building envelope will be conducted consistent with methodology found in the FHWA publication ***FHWA-PD-046, Measurement of Highway-Related Noise Final Report (1996)***.

Where applicable, the FDOT research publication ***"A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations"*** shall be used to assess whether noise abatement is feasible and/or reasonable at Activity Category D locations.

17-5.5.5 Activity Category E

Activity Category E includes the exterior impact criteria for developed lands that are less sensitive to highway traffic noise. The approach NAC level for this activity category is 71 dB(A). Examples of this activity category include hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in Activity Category A-D or F. Since these land uses are specifically excluded from Activity Category D, no analysis of interior noise levels will be required. Where applicable, the FDOT research publication ***"A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations"*** shall be used to assess whether noise abatement is feasible and/or reasonable at Activity Category E locations.

17-5.5.6 Activity Category F

Activity Category F includes developed lands that are not sensitive to highway traffic noise such as agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing. There is no NAC level for this activity category since the FHWA considers these land uses as not sensitive to highway traffic noise and therefore no noise analysis is required for these locations.

17-5.5.7 Activity Category G

Activity Category G includes undeveloped lands that are not permitted. There is no NAC level for this activity category. Although consideration of mitigation is not required, the FDOT must determine and document highway traffic noise levels and provide this information to local officials. Details on what will be required are found in ***Section 17-8.4***.

17-6 ANALYSIS OF NOISE ABATEMENT

When traffic noise impacts are identified as part of the analysis conducted consistent with ***Section 17-5***, noise abatement shall be considered and evaluated for feasibility and reasonableness. The FDOT shall determine and analyze alternative noise abatement measures to abate identified impacts by giving weight to the benefits and costs of abatement and the overall social, economic, and environmental effects by using feasible and reasonable noise abatement measures for decision-making. In abating

traffic noise impacts, the FDOT shall give primary consideration to exterior areas where frequent human use occurs.

The abatement measures listed on ***23 CFR 772.15(c)*** are eligible for Federal funding. Those measures are listed below in ***Section 17-6.4***. At a minimum, the FDOT shall consider noise abatement in the form of a noise barrier when a traffic noise impact is identified. Noise barriers will not include absorptive treatments unless one of two conditions exists:

1. The potential of reflective noise from a noise barrier will create a traffic noise level on the opposite side of the highway that would approach or exceed the NAC for the existing AC that would not be impacted without the reflective noise;

   Or

2. The potential of reflective noise from parallel noise barriers will degrade the overall noise reduction from one or both sides of the roadway such that the minimum noise reduction provided by the noise barrier falls below 5 dB(A).

Contact the FDOT Noise Program Administrator prior to the application of absorptive surface treatment under either of these two cases.

17-6.1 Feasibility Factors

17-6.1.1 Noise Reduction Factor

The feasibility of providing noise abatement is focused on the ability of the noise barrier to provide a reduction of at least 5 dB(A) to the impacted receptors. The more reduction you can achieve, the better the barrier, as long as the cost, visual impact, etc. of the barrier are not unreasonable. If a minimum of 5 dB(A) reduction cannot be achieved at a particular receptor, that receptor is not considered benefited. The number of impacted receptors required to achieve a 5 dB(A) reduction or greater in order for a noise barrier to be considered feasible will be two (2) or greater.

17-6.1.2 Design and Construction Factors

Designing a constructible noise abatement measure in a number of situations can be very difficult. Consideration should be given to whether or not a noise barrier can be constructed using standard construction methods and techniques. Factors to be considered include terrain changes, utilities, safety (lane closures, etc.), bridges, overpasses, and similar difficulties. The proposed plan should be reviewed by appropriate personnel to determine if alternative construction methods and techniques will increase the construction costs or time, impact roadway safety, or result in other impacts. Additional costs solely to accommodate construction of a noise barrier should be included in the cost reasonableness evaluation of the noise barrier.

If a noise barrier is expected to be placed on an existing structure (such as a bridge or a mechanically stabilized earth [MSE] wall) because of effectiveness or cost reasons, the ability of this structure to support the additional wind and dead loads safely must be

established before a final commitment to build the noise barrier is made. If a new bridge is being designed and a noise barrier is contemplated for placement on the bridge, the ability of the bridge to support the load of the noise barrier should be considered. Issues related to crash worthiness of a proposed noise barrier within the clear recovery zone must also be addressed. A noise barrier on structure or a MSE wall will not exceed 8 feet above the height of the bridge deck or MSE wall. Ground mounted barriers will not exceed 22 feet as noted in the ***FDOT Topic No. 625-000-007 Plans Preparation Manual (PPM), Volume 1, Chapter 32***.

17-6.1.3 Safety Factors

As noted above, safety is a very critical factor in determining whether a particular abatement measure is feasible. Noise barriers should be designed in accordance with ***Chapter 32 of the PPM***. If a conflict between a noise barrier and safety exists, primary consideration should be given to safety concerns. An example of such a conflict would be the loss of a safe sight distance at an intersection or driveway as a result of the placement of a noise barrier. Conflicts are considered during the feasibility assessment of the noise barrier and may result in a determination that a noise barrier is not feasible. Noise barriers will not exceed the following heights:

1. For noise barriers at the right-of-way line or outside the clear zone, the maximum height will be 22 feet.

2. For noise barriers on bridge and wall structures the maximum height will be 8 feet.

3. For noise barriers at the shoulder point, mounted on embankments only, the maximum height will be 14 feet.

4. All noise barriers within the clear recovery zone shall be either crash tested prior to application or protected by a traffic safety barrier or guard rail.

17-6.1.4 Access Factors

Accessibility to adjacent properties on non-limited access roadways must be given consideration since the placement of a noise barrier may block ingress and egress to these properties. Other access issues to be considered include access to a local sidewalk or normal routes of travel.

17-6.1.5 Right-of-Way Factors

Right-of-Way (ROW) needs, including access rights, easements for construction and/or maintenance, and additional land must be considered as part of the feasibility of noise barrier construction. ROW needs will be determined as early in the process as possible.

17-6.1.6 Maintenance Factors

Maintenance of a noise barrier must be considered to ensure that the barrier could be maintained using standard practices. Maintenance crews must have reasonable access on both sides of the barrier for both personnel and equipment. Since graffiti can be a serious problem, consideration should be given as to how it can be reduced.

17-6.1.7 Drainage Factors

Drainage is an important element that must be considered in the location and design of a noise barrier. Directing water along, under, or away from a noise barrier can cause construction and maintenance problems and therefore, must be given adequate consideration.

17-6.1.8 Utility Factors

Utility issues, including the impact of noise barriers on utilities and the reverse must be assessed early in the process. Both overhead and underground utilities can have a significant impact on design and construction options.

17-6.2 Reasonableness Factors

Once a noise abatement measure is determined to be feasible, the reasonableness of noise abatement will then be determined. The following reasonableness factors must collectively be achieved in order for the noise abatement measure to be deemed reasonable: consideration of the viewpoints of the benefited property owners and residents; the cost effectiveness of the highway traffic noise abatement measure; and the achievement of the FDOT noise reduction design goal.

17-6.2.1 Viewpoint of the Benefited Receptors

Prior to the PD&E phase, the public will have an opportunity to raise concerns about traffic noise impacts through the Efficient Transportation Decision-Making (ETDM) process. During the PD&E phase of the project, the viewpoints of potentially benefited receptors will be gathered during workshops, via the website established for the project (if one is used), and the Public Hearing for the project. A more detailed process to obtain the viewpoint of the benefited receptors is invoked during the design phase of the project. Each benefited receptor (owner or resident) will be given the opportunity to provide input to the FDOT regarding their desire to have the proposed noise abatement measure constructed. They may also be given the opportunity (at the discretion of the District) to provide input regarding their aesthetic preferences from a list of pre-selected options.

During the design phase of the project, the FDOT will use either a noise abatement workshop and/or a public survey to determine the wishes of the benefited receptors. The survey effort may include a mailing of information related to the abatement measure along with a survey form to be signed and returned to the FDOT. It is the desire of the FDOT to obtain a response for or against the noise barrier from a majority of the benefited receptors (owners and residents) that respond to the survey. Multiple

techniques to solicit input may be used, including multiple mailings, door-to-door follow up, and even telephone solicitation (as needed) to provide adequate information to allow the FDOT to make an informed decision on whether abatement is desired or not. If a majority of the benefited residents and property owners responding to the survey do not favor construction of a noise barrier, the FDOT will not provide the noise barrier. It is important to note that the viewpoints of the property owner will be considered as having the greatest weight in the decision as to whether the FDOT will provide noise abatement or not. While the viewpoint of the non-owner resident will be considered, their viewpoint will carry less weight, consistent with the formula shown in below:

Property Type	Owner Occupied Weighting Factor	Owner (non-occupied Weighting Factor	Renter Occupied Weighting Factor
Single Family	100%	90%	10%
Multi-family (duplex, apartments)	100%	90%	10%
Condominium	100%	90%	10%
Mobile Home Park (single owner)	NA	80%	20%
Offices, Businesses	100%	80%	20%

For example, if a renter of a single family home wishes to have noise abatement but the owner does not, the opinion of the home owner would prevail. If the owner of the home did not respond for or against the noise abatement measure, then the renters opinion would be used to be the equivalent of 10% of the vote of a home owner. This means that 10 renters in favor of the noise abatement would equal the vote of 1 owner occupied home.

17-6.2.2 Cost Effectiveness

The FDOT has established cost effectiveness criteria that have been in place for many years and has worked very well. The basis for the cost effectiveness criteria is that the FDOT has provided approximately 1,400 square feet of noise barrier per benefited receptor at a reasonable cost. The lower the cost, the higher the economic benefit will be to the impacted area. Using the current unit cost of $30.00 per square foot, a reasonable cost of $42,000 per benefited receptor is looked upon as the upper limit. Cost factor elements are reviewed annually by the FDOT and adjusted every five (5) years. The relationship between unit costs and the upper limit for cost reasonableness will be based on maintaining a constant upper limit of 1,400 square feet of noise barrier per benefited receptor. The FDOT considers these elements as part of the cost of a noise barrier:

1. The cost of materials and labor;

2. The cost of additional right-of-way (including the cost of construction and/or maintenance easements) needed exclusively to construct the noise barrier (if any);

3. Relocation of utilities when they are outside of the FDOT right-of-way; and

4. The cost of new or upgraded drainage structures required by the construction of a noise barrier.

Cost elements do not include the cost of designing the noise barrier, relocation of utilities (above or below ground) that are permitted within the FDOT ROW, clearing and grubbing, mobilization, maintenance of traffic, construction engineering and inspection, and related activities that are considered as part of the total construction project. To be considered as a noise abatement cost, the costs must be incurred because of the installation of the noise barrier. An example would be when you need to extend a culvert that would not be necessary for roadway construction but is required to construct the noise barrier.

It is important that the cost reasonableness of abatement be determined during the PD&E Study, to the extent possible, to enable the FDOT to make a statement of likelihood in the environmental document to pursue this mitigation effort in the design phase. The PD&E Noise Study should also note that the reasonableness of providing noise abatement in the form of a noise barrier is subject to a detailed review in design and subsequent reevaluations.

The primary method of determining the cost for noise abatement by the FDOT will involve a review of the cost per benefited receptor for the construction of a noise barrier benefiting a single location (such as a subdivision or contiguous impacted areas) with each area being considered a common noise environment area. A common noise environment implies that a group of receptors of the same NAC activity category are exposed to similar noise sources and levels, traffic volumes, traffic mix, speed, and topographic features. The common noise environment may not include mixed activity categories such as having two residential subdivisions that are separated by a commercial land use. In this example, the residential subdivisions would be considered separately for cost reasonableness purposes. Contact the District Noise Specialist for questions related to the application of the common noise environment criteria.

In the case of RV parks that also serve as a mobile home site, noise abatement will be considered when fifty-one (51) percent of the noise impacted spaces are occupied fifty-one (51) percent of the year or more by “permanent” residents. A permanent resident would be one who occupies the dwelling unit at least fifty one (51) percent of the calendar year. For these locations where usage is often seasonal and of short duration, the property owner will determine the occupancy rate of that portion of the facility that is impacted by traffic noise. If less than 51percent of the impacted spaces are occupied less than 51 percent of the year, abatement measures will not be considered. As is true with all potential noise barrier locations, the noise abatement measure must be feasible and reasonable before it will be considered further.

Third-party funding will not be allowed to subsidize the cost of a noise barrier for the purpose of making the noise barrier feasible or reasonable. Third-party funding as noted in ***23 CFR 772.13(j)*** is acceptable on a Federal or Federal-aid highway Type I or Type II project to make functional enhancements as long as the noise abatement measure already has been determined to be feasible and reasonable. **The FDOT does**

not consider third party funding in the development of noise abatement measures.

17-6.2.3 Noise Reduction Design Goal

The FHWA states in ***23 CFR 772.13(d)(2)(iv)*** that for an abatement measure to be considered reasonable, it must attain the FDOT noise reduction design goal. To ensure that the provision of reasonable traffic noise abatement will be considered at the greatest number of impacted locations, the FDOT has selected a 7 dB(A) noise level reduction for one (1) or more benefited receptors as the noise reduction design goal. Failure to achieve the noise reduction design goal will result in the noise abatement measure being deemed not reasonable. In setting this goal, the FDOT reviewed historic records of noise barrier reduction dating back to 1979. The average noise reduction for these noise barriers was 7.36 dB(A), which would indicate that the noise reduction design goal of 7 dB(A) would be reasonable.

17-6.3 Outdoor Advertising Sign Impacts

Although it is not to be considered as either a feasibility or reasonableness option, Florida Law requires consideration of the potential to construct a noise barrier that might block the motorist's view of an existing, conforming and legally permitted outdoor advertising sign. As early in the PD&E Study as possible, the District Outdoor Advertising section of the Office of Right-of-Way must be notified (consistent with the ***Right-of-Way Manual Topic No. 575-000-000***) in order to identify outdoor advertising signs affected by any proposed noise barrier. At a minimum, the section number and milepost for each noise barrier, along with an estimated construction date, will be given to the Outdoor Advertising Section so notice of the possible screening of a sign can be provided to the affected sign permit holder(s). (Note: If the latitude and longitude of the sign can be provided, this will assist the Outdoor Advertising section in locating the needed information).

Outdoor advertising signs that are legally permitted, conforming and erected may increase the height of the sign if visibility is blocked due to the construction of "noise attenuation" barriers consistent with ***Section 479.25, F.S.***. This statute requires the FDOT to notify a local government or local jurisdiction before erecting a noise barrier that will block a lawfully permitted sign. The local government or local jurisdiction is then required to notify the FDOT if increasing the height of an outdoor advertising sign will violate any local ordinance or land development regulation of the local government. When the notice has been received from the local government or local jurisdiction, and prior to the erection of the noise barrier, the FDOT shall inform all property owners identified as impacted by highway noise, and who may benefit from the proposed noise attenuation barrier, as part of a written survey, that:

1. Erection of a specific noise barrier may block the visibility of an existing outdoor advertising sign;

2. The local government or local jurisdiction may restrict or prohibit increasing the height of the existing outdoor advertising sign to make it visible over the noise barrier; and

3. If a majority of the impacted property owners vote for the construction of the noise barrier, the local government or local jurisdiction will be required to:

    a. Allow an increase in the height of the sign in violation of a local ordinance or land development regulation;

    b. Allow the sign to be relocated or reconstructed at another location if the sign owner agrees; or

    c. Pay the fair market value of the sign and its associated interest in the real property.

The statute also requires the FDOT to hold a Public Hearing within the boundaries of the affected local government or local jurisdiction to receive input on proposed noise barriers that may conflict with the local ordinances or land development regulations, and to suggest or consider alternatives or modifications to the proposed noise barrier to alleviate or minimize the conflict with the local ordinances or land development regulations, or minimize any costs associated with relocation, reconstructing, or paying for the affected outdoor advertising sign. Alternatives or modifications to proposed noise barriers that will not provide the minimum 5 dB(A) reduction will not be considered.

The written survey materials shall inform the affected property owners of the location, date, and time of the Public Hearing. The Public Hearing may be held concurrently with other Public Hearings scheduled for the project. A general notice of the Public Hearing shall also be published in a newspaper in accordance with the notice provision of ***Section 335.02(1), F.S.*** and contain the same information provided in the written survey materials. The notice shall not be placed in that portion of a newspaper in which legal notices or classified advertisements appear. Please refer to ***Part 1, Chapter 11, Public Involvement, of the PD&E Manual*** for additional details about meeting notification requirements.

The FDOT shall not construct a noise barrier that screens or blocks the visibility of a lawfully permitted outdoor advertising sign until after the Public Hearing is held and the numerical majority of the impacted property owners have approved the construction of the noise barrier. If the construction of the noise barrier is approved, the FDOT shall notify the local governments or local jurisdictions. The local governments or local jurisdictions shall then exercise one of the options listed above.

The FHWA has determined that the construction of business names/logos on noise barriers would be in violation of ***23 CFR 750.709***. For noise barriers in urban and suburban areas, imprinting of subdivision names or logos on the noise barrier may be considered only at the portion of the noise barrier at the legal entrance to the subdivision. The FDOT allows consideration of noise barrier aesthetic enhancement that meets the FHWA regulations related to this process. Each request for such an application will be handled on a case-by-case basis.

17-6.4 Traffic Noise Abatement Techniques

The most common type of traffic noise abatement measure is the construction of a noise barrier. As noted in ***23 CFR 772.13(c)(1)***, the FHWA requires that, at a minimum, the FDOT shall consider noise abatement in the form of a noise barrier. Therefore, all impacted receptors will require analysis for traffic noise reduction using a noise barrier. FHWA considers traffic management, alteration of horizontal and vertical alignments, acquisition of real property to create a buffer zone, and noise insulation of Activity Category D land use to also be acceptable noise abatement measures.

Federal funds (as appropriate) may be used for noise abatement on Type I projects when traffic noise impacts have been identified and abatement measures have been determined to be feasible and reasonable pursuant to ***23 CFR 772.13(d)***. The primary noise abatement measure to be considered by the FDOT for incorporation into a Type I project to reduce traffic noise impacts will be the construction of a noise barrier (including acquisition of property rights) that is either within or outside the highway right-of-way. **Landscaping is not a viable noise abatement measure.**

Traffic noise abatement is considered only if the predicted future build traffic noise level approaches or exceeds abatement levels in the NAC, or if build traffic noise levels substantially exceed existing noise levels as determined in ***Section17-5*** above. If no impacts are identified, proceed to ***Section 17-8***.

When considering noise barriers for noise abatement, the feasibility and reasonableness factors discussed in ***Sections 17-6.1 and 17-6.2*** must be evaluated for each viable alternative under detailed analysis.

Noise abatement will not be required for Activity Category F or Activity Category G uses.

The document, ***"A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations"***, should be used to ensure the reasonableness of abatement for Activity Category C, D and E land uses.

17-7 COMMUNITY COORDINATION

17-7.1 Community Coordination in PD&E

As noted in ***Section 17-6.2.1*** above, the degree and type of community coordination and participation will vary from project to project. For projects requiring consideration of abatement, the community involvement activities should allow for presentation and discussion of noise impacts related to the project. Opportunities for such involvement should be provided, as appropriate, during the environmental evaluation and documentation phase as part of the public involvement and/or public hearing process.

17-7.2 Community Coordination in Final Design

When noise abatement is anticipated in the final design phase, community coordination will include a survey of benefited property owners and residents to determine their viewpoints regarding abatement. This can be done using any number or combination of techniques (e.g., door-to-door contact, telephone polls, mailed survey form, public workshop, etc.).

The viewpoint of the impacted and benefited receptors related to abatement should be analyzed in the decision-making process. Discussions at public meetings may also include a presentation of material options, physical dimensions, obtainable levels of reduction, and cost factors so the public can aid the FDOT in making a reasonable decision.

In the event that some benefited property owners or residents' desire noise abatement and others do not, further assessment may be necessary in order to determine what impact, if any, this will have on the feasibility and reasonable cost issues as well as the social consequences. Consultation with FHWA (if appropriate) is recommended. When noise abatement measures are being developed during final design, such measures will not be approved without documentation (letters in the file, public hearing transcripts, survey results, etc.) that the benefited property owners or residents have been provided the opportunity to provide input into the final design. The benefited property owners or residents consist of those individuals directly affected by the project-related noise as well the abatement measure.

When noise barriers are proposed, primary emphasis is to be given to the input of the benefited property owners immediately adjacent to the noise barrier(s). If the majority of those responding to the survey do not favor abatement, the FDOT will not provide the proposed abatement measure.

17-8 PREPARATION OF THE NOISE STUDY REPORT

17-8.1 Noise Study Report Contents

The results of the noise analyses shall be reported in a ***NSR*** and summarized in the environmental document. All viable alternatives will be analyzed, including the no-build alternative.

The ***NSR*** should have a logical sequence which adequately describes the procedures used in developing the ***NSR***, performing the required analyses, and arriving at the appropriate conclusions. Graphics and references should be utilized to make the report easily understood by both a technical reviewer and a layman. All noise readings should be reported to the nearest 1/10th of a decibel but do not include TNM input/output sheets. The ***NSR*** will also include: the existing (measured or predicted) as well as the predicted future build and no-build noise levels for each receptor; required field monitoring data and any necessary explanation of the results of this data; a complete set of aerials showing the full project limits and the location of receptor points

used in the noise analysis; and the date of the last review of land use that was considered in the ***NSR***. ***Figure 17.1*** illustrates a recommended outline for the ***NSR***.

17-8.2 Methodology and Assumptions

The following information related to methodology and assumptions shall be included in the ***NSR***:

1. Model(s) and methodology used;

2. Alternatives and years considered;

3. Existing and design year vehicle volumes, speeds, and composition data;

4. Receptor locations and descriptions, including land use activity category;

5. Basis for determination of existing and future traffic noise levels; and

6. Noise descriptor used.

To assist the public in understanding how traffic noise levels relate to other sound sources, an illustration similar to ***Figure 17.2*** should be included in all noise studies.

17-8.3 Application of FHWA Noise Standards

The ***NSR*** will include a comparison of the total traffic noise levels for each build and no-build alternative along with the appropriate noise abatement criteria and existing (measured or predicted) noise levels. All abatement considerations and a statement of likelihood shall be included in the ***NSR*** and environmental document.

17-8.4 Coordination Requirements and Documentation

Summarize in the ***NSR*** any coordination or communications that may have taken place with other agencies and the public. Include their comments and any responses to any comments. A statement should also be made that a copy of the final ***NSR*** will be circulated to the appropriate local planning/zoning officials for their use in land use control once the Location and Design Concept Acceptance or SEIR approval occurs. The ***NSR*** should also include a representation of the best estimate of the distances from the proposed edge of the nearest travel lane at which traffic noise levels would approach or exceed the NAC for each activity category found within each segment of the project as shown in ***Figure 17.3***.

When the ***NSR*** is finalized and following Location and Design Concept Acceptance or SEIR approval, copies shall be sent to the appropriate local government officials within whose jurisdiction the highway project is located. In the cover letter, the following information should be transmitted along with the ***NSR*** consistent with ***23 CFR 772.17(a)***:

1. Noise compatible planning concepts;

2. A representation of the estimated distances from the proposed edge of the nearest travel lane at which traffic noise levels would approach or exceed the NAC for each activity category found within each segment of the project; and

3. After the “Date of Public Knowledge”, the FDOT is no longer responsible for providing noise abatement for new development which occurs adjacent to the proposed highway project. To encourage the local government(s) and private developers to accept responsibility for incorporating the control of traffic noise into future planning of noise sensitive activities, the FDOT has established a process designed to inform these entities of the need for compatible land use control or for requiring proactive noise abatement measures.

The above items are intended solely to assist local officials and private developers in promoting compatibility between land development and highways. Upon request, the Department may provide additional available material and technical guidance which may assist local officials and private developers in this respect.

17-8.5 Noise Abatement Commitments

Before adoption of a CE, FONSI, ROD, NMSA, or SEIR, the FDOT shall identify:

1. A Statement of Likelihood for the noise abatement measures which are feasible and reasonable, and which are likely to be incorporated in the project; and

2. Noise impacts for which no noise abatement measures are feasible and reasonable.

23 CFR 772.13(h) states that the FHWA will not approve project plans and specifications unless feasible and reasonable noise abatement measures are incorporated into the plans and specifications to reduce the traffic noise impact on existing activities, developed lands, or undeveloped lands for which development is permitted.

Noise abatement commitments will be made two (2) times during a project's development. The first time will be during the time that the environmental document is being finalized. By then, the noise studies will have progressed to the stage where noise-impacted areas have been identified. At this stage, it is unlikely that exact locations, abatement types, right-of-way requirements, etc., can be determined, although approximate noise barrier location and height information should be available. The second time will be during final design prior to Plans, Specifications, and Estimates (PS&E) approval.

23 CFR 772.13(i) notes that for design-build projects, the PD&E phase ***NSR*** shall document all considered and proposed noise abatement measures for inclusion in the environmental document. **All traffic noise analyses for design-build projects must be prepared by the FDOT and provided to the design-build team**. Noise abatement

measures shall be considered, developed, and constructed in accordance with ***23 CFR 772*** and in conformance with the provisions of ***40 CFR 1506.5(c)*** and ***23 CFR 636.109***.

For noise impacted areas requiring abatement consideration, in accordance with ***23 CFR 772***, the PD&E environmental clearance document shall contain a Statement of Likelihood similar to the following:

> "The Florida Department of Transportation is committed to the construction of feasible and reasonable noise abatement measures at the noise-impacted locations identified in (table, figure, chart, etc.) contingent upon the following conditions." (You may select any or all of the items listed below, or, if appropriate, create contingencies of your own.) :
>
> 1. Detailed noise analyses during the final design process supports the need, feasibility and reasonableness of providing abatement;
>
> 2. Cost analysis indicates that the cost of the noise barrier(s) will not exceed the cost reasonable criterion;
>
> 3. Community input supporting types, heights, and locations of the noise barrier(s) is provided to the District Office; and
>
> 4. Safety and engineering aspects as related to the roadway user and the adjacent property owner have been reviewed and any conflicts or issues resolved.

If, during the final design phase, abatement is no longer considered feasible or reasonable for a given location(s), such determination(s) will be made prior to requesting approval for construction advertisement. Commitments regarding the exact abatement measure locations, heights, and type (or approved alternatives) will be made during the final design phase and at a time before the construction advertisement is approved.

If abatement is not feasible or reasonable, the following statement (or variation thereof) shall be used: "Based on the noise analyses performed to date, there appears to be no apparent solutions available to mitigate the noise impacts at the locations identified in (table, figure, chart, etc.)."

As noted in ***Section 17-6***, the FDOT noise reduction design goal is 7 dB(A) for one or more benefited receptors. A minimum insertion loss of 5 dB(A) or more is required to be considered a benefited receptor. During the final design phase, the noise abatement locations, noise barrier types, lengths and heights will be determined. The final noise abatement commitments must be documented in the environmental reevaluation and the ***Noise Study Report Addendum (NSRA)*** prior to construction advertisement, regardless of project funding sources. It is the responsibility of the District environmental staff to ensure that all noise abatement commitments that were made are provided to

the projects design staff (in-house or consultant). This will include copies of the ***NSR***, any pertinent design-related information gained from the public involvement process, and basic design information such as wall height, location, and aesthetic treatment. The environmental staff will ensure that the final noise abatement commitments are reflected in the reevaluation of the environmental document and will obtain concurrence from FHWA or from the District Secretary (or designee) in the case of a SEIR.

17-9 CONSTRUCTION NOISE AND VIBRATION IMPACTS

The early identification of potential construction noise and/or vibration impacts that may result from the construction of the project is important. Any potential construction noise or vibration impacts that are identified in the PD&E phase shall be documented in the ***NSR*** and in the environmental clearance document, along with any identified abatement measures that are potentially feasible and reasonable. A list of example construction noise and vibration sensitive receptors has been developed and can be found in ***Table 17.3***. This will allow avoidance and/or mitigation options to be developed during the final design phase. These options can then be placed in the construction plans and applied during the construction of the project by the Contractor.

The discussion of construction noise and vibration impacts is required for inclusion in the environmental document whether the noise abatement criteria are exceeded or not. It is generally based on site specific conditions and should, as a minimum, include a general reference to the ***Standard Specifications for FDOT*** construction to control noise and/or vibration impacts and any local ordinances that relate to construction noise and/or vibration levels allowed. It should be noted that ***Section 335.02, F.S.***, exempts the FDOT from compliance with local ordinances. FDOT policy is to follow the requirement of local ordinances to the extent that it is reasonable. Examples of standard specifications that may be applied to a project include:

1. ***Section 6-3.1*** related to the storage of materials to minimize noise impacts on sensitive receivers;

2. ***Section 100-2.1*** related to equipment approval requiring the use of factory recommended exhaust mufflers and to remove or repair any equipment that is disapproved by the Engineer;

3. ***Section 100-2.2*** requires adequate equipment maintenance to minimize noise pollution caused by construction equipment;

4. ***Section 100-2.3*** suggests that all stationary equipment be screened from noise sensitive receivers beyond normal working hours and, if feasible, screen this equipment during normal working hours to reduce noise impacts;

5. ***Section 120-6.4*** addresses the concept of establishing haul routes which will direct construction vehicles away from developed areas when feasible and keep noise from hauling operations to a minimum; and

6. ***Section 455-1.1*** requires that the Contractor take reasonable precautions to prevent structural damage to existing building and to conduct monitoring of structures for settlement as warranted.

For projects anticipated to have substantial construction noise impacts, the noise and/or vibration analysis for the environmental document will include a detailed assessment of impacts. The FHWA ***"Highway Construction Noise Handbook"*** provides excellent guidance for the prediction and mitigation of construction noise. The Roadway Construction Noise Model (RCNM), which is the FHWA's national model for the prediction of construction noise, may be used as needed. The RCNM provides a construction noise screening tool to predict construction noise levels and determine compliance with noise limits for a variety of construction noise projects of varying complexity. The use of the RCNM should be coordinated with the FHWA Division Office prior to application (as appropriate).

Any recommended special construction noise and/or vibration mitigation measures identified during the review of potential construction and/or vibration impacts will be described in the ***NSR*** and in the environmental documents commitment section. In considering construction noise and/or vibration mitigation, it should be noted that special provisions may be added as appropriate to the project's construction specifications. Any unique noise and/or vibration control efforts to be considered during construction shall be coordinated with the appropriate District management staff prior to inclusion in the ***NSR***.

Note: Only special provisions need to be detailed in the environmental document and the *NSR* since standard specifications need only be given a general reference.

A sample construction noise and vibration statement follows:

> "Based on the existing land use within the limits of this project, construction of the proposed roadway improvements will (will not) have any noise impact. Those construction noise and/or vibration impacts that have been identified and for which abatement measures appear to be feasible and reasonable (if any) are noted in the Statement of Likelihood of the ***NSR*** and in the Commitments section of the environmental clearance document. If noise-sensitive land uses develop adjacent to the roadway prior to construction, additional impacts could result. It is anticipated that the application of the ***FDOT Standard Specifications for Road and Bridge Construction*** will minimize or eliminate most of the potential construction noise and vibration impacts. However, should unanticipated noise or vibration issues arise during the construction process, the Project Engineer, in concert with the District Noise Specialist and the Contractor, will investigate additional methods of controlling these impacts."

17-10 NOISE STUDY REPORT REVIEW

Once the ***NSR*** is completed, it will be reviewed by the District environmental staff where the technical adequacy of the report will be determined. If necessary, a meeting and/or field review may be held to verify information and/or resolve conflicts. The ***NSR*** is to be considered complete at this point for purposes of proceeding with the preparation of the environmental document. It may ultimately be revised during the final design phase and subsequent reevaluations to reflect details regarding exact abatement measures, their location, and types. The final noise abatement commitments must be documented in the environmental reevaluation and the ***NSRA*** prior to construction advertisement, regardless of project funding sources. It is the responsibility of the District Design Project Manager to ensure that all noise abatement commitments that were made are provided to the project's design staff (in-house or consultant). This will include copies of the ***NSR***, any pertinent design-related information gained from the public involvement process, and basic design information such as wall height, location, and aesthetic treatment. The environmental staff will ensure that the final noise abatement commitments are reflected in the reevaluation of the environmental document and in the design plans for the project. This reevaluation will be approved by the FHWA or the FDOT District Secretary, as applicable.

If the ***NSRA*** is substantially modified from the version previously distributed to the affected local governments, a revised version should be sent out to them.

17-10.1 Noise in the Type 2 Categorical Exclusion

For a Type 2 CE, include the following documentation with the appropriate forms:

1. If NONE is marked for noise, then a very brief summary of the ***NSR*** should be attached.

2. If MINIMAL is marked for noise, then a brief summary of the ***NSR*** should be attached with noise values presented in written form, including any noise abatement commitments.

If noise impacts occur, this will also be stated in summarized form, including noise abatement commitments. The CE should indicate where a copy of the ***NSR*** is available for public review.

17-10.2 Noise in the EA/FONSI

The Impacts section of the EA must reference and summarize the ***NSR.*** Specific references to the items discussed in ***Section 17-5 and 17-6*** are included as appropriate. Coordination which occurred during the noise study process must be documented. The Comments and Coordination section shall discuss the history of the noise process and include letters from agencies expressing comments on the ***NSR***. Resolution of comments shall also be documented in this section. In FONSIs, the Summary Section includes a brief statement indicating the effect of the project as

related to the FHWA NAC. The availability of the ***NSR*** in the District Office should be noted.

17-10.3 Noise in the Environmental Consequences Section of the Draft and Final Environmental Impact Statement or State Environmental Impact Report

The Environmental Consequences section should summarize the ***NSR*** and include the following information:

1. A brief description of noise sensitive areas, including information on the numbers and types of activities which may be affected. The availability of the ***NSR*** in the District Office will be noted.

2. The extent of the impact (in decibels). This will include a comparison of the future predicted noise levels with both the FHWA NAC and the existing predicted noise levels.

3. Noise abatement measures which have been considered and those measures that would likely be incorporated into the proposed project.

4. Noise impacts for which no feasible and reasonable abatement is available and the reasons why.

17-10.4 Noise in the Reevaluation Process

The reevaluation of any environmental document that included a ***NSR*** shall also include an update of the noise analysis for any noise studies. Assumptions made and data used during the original noise analysis and documented in the ***NSR*** shall be reviewed and updated to ensure the assumptions and any preliminary commitments are still valid. This may include, but not necessarily be limited to, current and future traffic data (volumes, speeds, composition), roadway alignment (horizontal and vertical), land use, propagation path, barriers/buffers (including trees, berms, structures), variation in terrain between noise source and receptors, etc. The reevaluation may result in no change to the ***NSR*** or in a completely new ***NSR*** being required. As a minimum, it must be documented that the original noise study and analysis was reviewed and that the assumptions, project conditions and results are still valid. Computer modeling efforts will be conducted using the latest version of TNM, for any required subsequent noise reevaluation as a result of a major design change. Since the changes made to ***23 CFR 772*** are considered to be a major change in a regulatory requirement, all noise reevaluations conducted after July 13, 2011 will be done in accordance with ***23 CFR 772*** dated July 13, 2010. Coordination with the FHWA Division Office during the reevaluation process on federally funded projects is required.

17-11 ABATEMENT MEASURE REPORTING

Beginning with the reporting period 2011-2013, ***23 CFR 772.13(f)*** requires that the FDOT maintain an inventory of all constructed noise abatement measures. This inventory shall include the following parameters:

1. Type of abatement;

2. Cost (overall cost, unit cost per/sq. ft.);

3. Average height;

4. Length;

5. Area;

6. Location (state, county, city, route);

7. Year of construction;

8. Average insertion loss/noise reduction as reported by the model in the noise analysis;

9. NAC category(s) protected;

10. Material(s) used (precast concrete, berm, block, cast in place concrete, brick, metal, wood, fiberglass, combination, plastic [transparent, opaque, other]);

11. Features (absorptive, reflective, surface texture);

12. Foundation (ground mounted, on structure); and

13. Project type (Type I, Type II) and optional project types such as state funded, county funded, tollway/turnpike funded, other, unknown.

The FHWA will collect this information, in accordance with Office of Management and Budget's Information Collection requirements, on a tri-annual basis.

The report covering the period 2008-2010 will contain information in the same format as it was reported in 2007. The information to be reported will include:

1. Location (state, county, city, route);

2. Material;

3. Type (Type I, Type II, State-funded, Tollway funded, Other, Unknown);

4. Year;

5. Length (in feet);

6. Height (average in feet);

7. Cost per/sq. ft.; and

8. Total cost

This information will be gathered by the District Noise Specialist and provided to the Statewide Noise Program Administrator for compilation of the report to be submitted to the FHWA. The FDOT Statewide Noise Program Administrator will establish a date after which all inventory data shall be supplied in the format required by ***23 CFR 772.13(f)***. An inventory will be established for the purpose of gathering this data and the inventory will be accessible to District staff for input and report downloading.

17-12 REFERENCES

1. 23 CFR Part 772, "Procedures for Abatement of Highway Traffic Noise and Construction Noise", Federal Register, Vol. 75, No. 133, Tuesday, July 13, 2010; pages 39834-39839. Available at: http://edocket.access.gpo.gov/2010/pdf/2010-15848.pdf

2. Federal Highway Administration Report FHWA-HEP-10-025, "Highway Traffic Noise: Analysis and Abatement Guidance", June 2010 (revised December, 2010); 76 pages. Available at:

   http://www.fhwa.dot.gov/environment/noise/regulations_and_guidance/analysis_and_abatement_guidance/guidancedoc.pdf

3. Florida Statute 335.17, "State highway construction; means of noise abatement." 1989; 1 page. Available at: http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0335/Sections/0335.17.html

4. Florida Department of Transportation Policy, "Noise Abatement". Topic 000-360-005-f; Effective September 20, 2007; 1 page. Available at: http://www2.dot.state.fl.us/proceduraldocuments/procedures/bin/000360005.pdf

5. Federal Highway Administration Report Number FHWA-PD-96-009, "FHWA Traffic Noise Model, Version 1.0 User's Guide." January 1998, 192 pages + supplements. Available at: http://www.fhwa.dot.gov/environment/noise/traffic_noise_model/old_versions/tnm_version_10/users_guide/tnm10usersguide.pdf

6. Federal Highway Administration Report Number FHWA-PD-96-046, "Measurement of Highway-Related Noise." Cynthia S.Y. Lee and Gregg Fleming; May, 1996; 206 pages. Available at: http://www.fhwa.dot.gov/environment/noise/measurement/mhrn00.cfm

7. 14 CFR Part 150, "Airport Noise Compatibility Planning." December 13, 1984 (as updated). Available at: http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgFAR.nsf/Frameset?OpenPage

8. 49 CFR Part 210, “Railroad Noise Emission Compliance Regulations”. Federal Railroad Administration; Revised as of October 1, 2000. Available at: http://www.fra.dot.gov/Pages/173.shtml

9. Federal Transit Administration Report Number FTA-VA-90-1003-06, “Transit Noise and Vibration Impact Assessment.” May 2006, 261 pages. Available at: http://www.fta.dot.gov/documents/FTA_Noise_and_Vibration_Manual.pdf

10. “A Method to Determine Reasonableness and Feasibility of Noise Abatement at Special Use Locations.” Roger L. Wayson and John M. MacDonald. University of Central Florida; Updated July 22, 2009; 64 pp. Available from: Florida Department of Transportation, Environmental Management Office, 605 Suwannee Street, M.S. 37, Tallahassee, FL 32399-0450.

11. Florida Department of Transportation Plans Preparation (Topic No. 625-000-007) Manual Volume 1, Chapter 32, “Sound Barrier Walls.” January 2010; 16 pages. Available at: http://www.dot.state.fl.us/rddesign/PPMManual/2010/Volume1/Chap32.pdf

12. Florida Department of Transportation Right-of-Way Manual (Topic No. 575-000-000), Section 7.14, Outdoor Advertising Signs; Revised July 9, 2010; 5 pages. Available at: http://www.dot.state.fl.us/rightofway/documents/ROWmanual/ch07s14.pdf

13. Florida Statute 479.25, “Erection of noise-attenuation barrier blocking view of sign; procedures; application.” July 1, 2006; 5 pages. Available at: http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0400-0499/0479/Sections/0479.25.html

14. Florida Statute 335.02, “Authority to designate transportation facilities and rights-of-way and establish lanes; procedures for redesignation and relocation; application of local regulations.” 2003; 2 pages. Available at: http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0335/Sections/0335.02.html

15. 23 CFR Part 750.709; On-property or on-premise advertising. Federal Highway Administration; December 9, 1991. Available at: http://www.fhwa.dot.gov/legsregs/directives/fapg/cfr0750g.htm

16. 40 CFR Part 1506.5(c), “Environmental impact statements”, Vol. 43, Federal Register, Nov. 29, 1978; 1 page. Available at: http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&sid=c7c1095a6952f2fd3aaec1c61708b1e1&rgn=div5&view=text&node=40:32.0.3.3.7&idno=40#40:32.0.3.3.7.0.29.5

17. 23 CFR Part 636.109, “How does the NEPA process relate to the design-build procurement process?” Vol. 72 Federal Register, Page 45337, Aug. 14, 2007. Available at:

http://edocket.access.gpo.gov/cfr_2007/aprqtr/pdf/23cfr636.109.pdf

18. Florida Department of Transportation "Standard Specifications for Road and Bridge Construction." 2010; 996 pages. Available at: ftp://ftp.dot.state.fl.us/LTS/CO/Specifications/SpecBook/2010Book/2010Master.pdf

19. Federal Highway Administration Report FHWA-HEP-06-015, FHWA Highway Construction Noise Handbook: Final Report," August 2006; 185 pages. Available at: http://www.volpe.dot.gov/acoustics/docs/2000/2006-dot-vntsc-fhwa-06-02.pdf

20. Federal Highway Administration Report FHWA-HEP-06-015, FHWA Roadway Construction Noise Model User's Guide: Final Report," January 2006; 30 pages. Available at: http://www.fhwa.dot.gov/environment/noise/construction_noise/rcnm/rcnm.pdf

NOISE ABATEMENT CRITERIA
[Hourly A-Weighted Sound Level-decibels (dB(A))]

Activity Category	Activity Leq(h)[1]		Evaluation location	Description of activity category
	FHWA	FDOT		
A	57	56	Exterior	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B[2]	67	66	Exterior	Residential
C[2]	67	66	Exterior	Active sports areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreational areas, Section 4(f) sites, schools, television studios, trails, and trail crossings.
D	52	51	Interior	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios.
E[2]	72	71	Exterior	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F.
F	–	–	–	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing.
G	–	–	–	Undeveloped lands that are not permitted.

(Based on Table 1 of 23 CFR Part 772)

[1] The Leq(h) Activity Criteria values are for impact determination only, and are not design standards for noise abatement measures.

[2] Includes undeveloped lands permitted for this activity category.

Note: FDOT defines that a substantial noise increase occurs when the existing noise level is predicted to be exceeded by 15 decibels or more as a result of the transportation improvement project. When this occurs, the requirement for abatement consideration will be followed.

TABLE 17.1 Noise Abatement Criteria

Building Type	Window Condition*	Noise Reduction Due to Exterior of the Structure
All	Open	10 dB
Light Frame	Ordinary Sash (closed)	20 dB
	Storm Windows	25 dB
Masonry	Single Glazed	25 dB
	Double Glazed	35 dB

*The windows shall be considered open unless there is firm knowledge that the windows are in fact kept closed almost every day of the year.

Source: FHWA Highway Traffic Noise: Analysis and Abatement Guidance. August 11, 2010.

TABLE 17.2 Building Noise Reduction Factors

Noise	Vibration
Eye Centers/Clinics Medical Centers Hospitals Geriatric Centers Sound Recording Studios TV/Radio Stations Residences Technical Laboratories Hearing Testing Centers Theaters Schools Motels/Hotels Funeral Homes Libraries Meditation Centers Churches/Shrines Parks Day Care Centers Outdoor Theaters	Eye Centers/Clinics Medical Centers Hospitals Geriatric Centers Sound Recording Studios TV/Radio Stations Residences Technical Laboratories Antiques Shops Museums Historic Buildings
Note: This list is not meant to be all inclusive or exclusive, but rather an indication of the type of sites likely to be sensitive to construction noise and/or vibration.	
Source: FDOT Noise and Vibration Task Team; August 17, 1999.	

TABLE 17.3 Construction Noise and Vibration Sensitive Sites (a partial listing of potential sites)

SUGGESTED NOISE STUDY REPORT OUTLINE

Executive Summary (optional)

Table of Contents

List of Figures

List of Tables

INTRODUCTION

- Purpose
- Project Description
- Need for Improvement

METHODOLOGY

- Model and Noise Metrics
- Traffic Data

TRAFFIC NOISE ANALYSIS

- Noise Sensitive Areas
- Measured Noise Levels
- Predicted Noise Levels
- Noise Impact Analysis
- Noise Abatement Measures

CONCLUSIONS

CONSTRUCTION NOISE AND VIBRATION

PUBLIC COORDINATION

BIBLIOGRAPHY

APPENDICES

FIGURE 17.1 Noise Study Report Outline

COMMON OUTDOOR ACTIVITIES	NOISE LEVEL dB(A)	COMMON INDOOR ACTIVITIES
	---110---	Rock Band
Jet Fly-over at 1000 ft		
	---100---	
Gas Lawn Mower at 3 ft		
	---90---	
Diesel Truck at 50 ft, at 50 mph		Food Blender at 1 m (3 ft)
	---80---	Garbage Disposal at 1 m (3 ft)
Noise Urban Area (Daytime)		
Gas Lawn Mower at 100 ft	**---70---**	Vacuum Cleaner at 10 ft
Commercial Area		Normal Speech at 3 ft
Heavy Traffic at 300 ft	**---60---**	
		Large Business Office
Quiet Urban Daytime	**---50---**	Dishwasher Next Room
Quiet Urban Nighttime	**---40---**	Theater, Large Conference Room
Quiet Suburban Nighttime		(Background)
	---30---	Library
Quiet Rural Nighttime		Bedroom at Night, Concert Hall (Background)
	---20---	
	---10---	
Lowest Threshold of Human Hearing	**---0---**	Lowest Threshold of Human Hearing

Source: California Dept. of Transportation Technical Noise Supplement, Oct. 1998, Page 18.

FIGURE 17.2 Typical Noise Levels

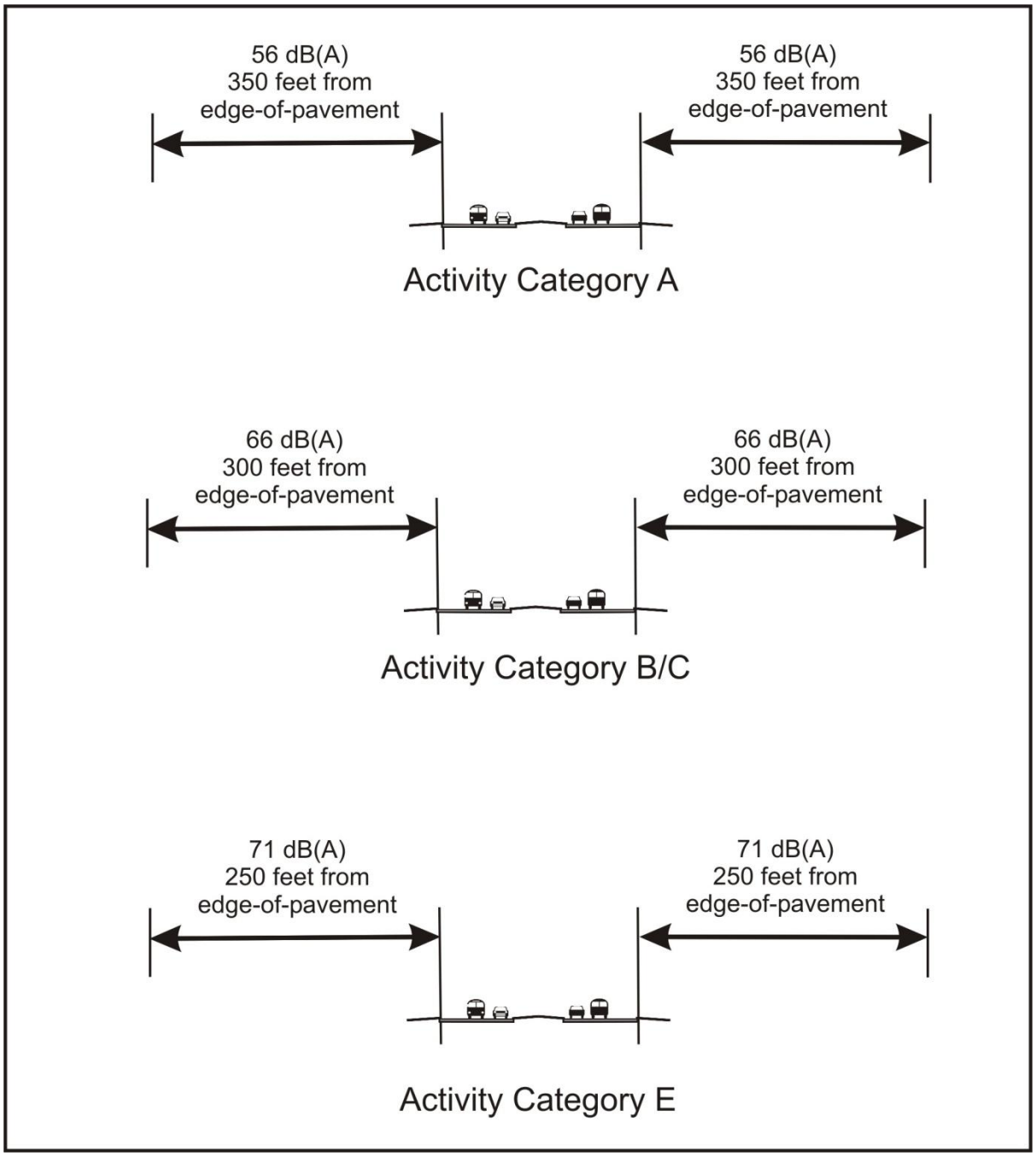

FIGURE 17.3 Sample Noise Contours